CHEM 217-01

Analytical Chemistry 1 (3 credits)

Final Course Outline

Fall 2025

Gregor Kos

August 26, 2025

1 Course description

Chemistry 217 is an introduction to the theories and concepts of analytical chemistry. Based on your knowledge of stoichiometry and acids/bases, the course material covers basic statistics, polyprotic acid-base equilibria, i.e., acid-base equilibria, volumetric analysis, complexometry and introductory chromatography. Following a theoretical introduction, a wide range of applications are discussed, including problem sets and lab experiments that have direct relevance for work in professional and academic labs (e.g., statistics, buffer preparation, pH calculations, EDTA titrations and chromatography).

2 Learning outcomes

1. Know and apply the steps of the analytical process in lab experiments (practical and described)

2. Evaluate data using standard statistical parameters and methods, e.g., mean, standard deviation, statistical tests, confidence interval and measures for uncertainty.

3. Understand and apply the mathematical framework to describe equilibrium processes under standard and non-standard conditions.

4. Carry out titration curve calculations for analytically relevant reactions, specifically acid/base and complexometric reactions.

5. Know the properties and usage of common acid/base and complexometry titrants and indicators with their advantages and disadvantages.

6. Know the principles of and apply analytical techniques such as gravimetry, acid/base and complexometric titrations and calculate concentrations of analytes with data from realistic measurement scenarios.

7. Know measurement principles and experimental setups of gas and liquid chromatographic methods.

3 Course administration

Instructor: Gregor Kos, `gregor.kos@concordia.ca`

Office: Chemistry & Biochemistry, SP 275.21

Office hours: Tue, 10h00–11h00 & Thu, 14h00–15h00

Prerequisites: CHEM205, 206; PHYS204, 206, 224, 226; MATH 203, 205

Class time: Wed & Fri, 10h15 – 11h30

Room: CC 308 LOY

Course website: `http://moodle.concordia.ca` (automatic enrolment)

Course text: Daniel C. Harris and Charles A. Lucy, Quantitative Chemical Analysis, 10ed, MacMillan Learning, 2020; available for **rent through Perusall (see below)!**.

4 Electronic teaching tools

In addition to Moodle, electronic teaching tools will support your preparation for in-person class. These are –

- **Perusall** (`https://perusall.com`) for pre-reading and online discussions; sign-up required with real name and Student ID for grading.
- **myDalite** (`https://mydalite.org`) for online quizzes; sign-up required with real name and Student ID for grading.
- **iClicker** (`https://www.iclicker.com`) for responses during in-class exercises; sign-up required with real name and Student ID for grading.

Regarding the use of third-party software and transmission of personal information, please see below.

5 Assessment

During the term weekly pre-readings with discussion, quizzes will be required to prepare for class. The midterm, together with the cumulative final exam and the lab section (scheduled separately) the final mark will be calculated.

5.1 Grade breakdown

- Weekly pre-reading & discussions (Persuall): 12%
- Weekly quizzes (myDalite): 6%
- Clickers: 6%
- Midterm (in–class): 16%
- Final (centrally scheduled): 35%
- Laboratory section: 25%

You need a passing grade for both, the lecture and lab portion of the course. For the lecture a passing grade from midterm and final exams ($> 50\%$) is required. The final exam is mandatory to pass the course. The passing grade for the lab is $> 60\%$. Once a passing grade from the exams is determined, all other grades will be added to calculate the final mark.

For the midterm and the final exam, students can use the printed formula sheet without personal notes; highlighting allowed. Bring it to class for practice sessions and to exams. You may use a programmable calculator for exams only after a hard reset in front of the instructor before the exam.

For calculation of marks, **missing units** (-1 mark) and an incorrect number of **significant figures** (-0.5 marks) in a final result will lead to **automatic deductions** outside the regular marking scheme for each occurrence of the error(s) in the exam. Revise unit analysis and significant figure rules as early as possible, if needed.

5.2 Passing and failing grades

Passing grades –

A+	**A**	**A-**	**B+**	**B**	**B-**
100-90	89-85	84-80	79-77	76-73	72-70

C+	**C**	**C-**	**D+**	**D**	**D-**
69-67	66-63	62-60	59-57	56-53	52-50

Failing grades –

F	**R**
$< 50\%$ (lecture)	$< 40\%$ (lecture) or $< 60\%$ (lab)

Students receiving an "R" grade for the course must repeat all components of the course, including the lab.

6 Important dates

Every week assigned pre-reading sections will be posted on Perusall. Marks will be awarded for participating in discussions (asking good questions, providing answers). You have until Sunday evening (11 pm) of the week to complete the pre-reading, discussions and a weekly quiz on myDalite.

Date	**Event**
2 Sep 2025	Classes start
	Register for CHEM 101 seminar
5 Sep 2025	Deadline to submit lab exemption, noon
8 Sep 2025	Labs start
9 Sep 2025	Clicker usage starts
15 Sep 2025	DNE; withdrawal with refund
10 Oct 2025	Midterm exam
11-17 Oct 2025	Reading week; no class
10 Nov 2025	DISC; withdrawal without refund
1 Dec 2025	Last class
TBD	Final exam (scheduled by Exams Office)

7 Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the Academic Regulations, the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the changes. Please monitor your emails and the Moodle site for the course for any changes.

8 Attendance

8.1 Lecture

I strongly suggest to attend class regularly. Midterm and final examinations will be conducted following university regulations. For a missed midterm (no supplemental) with short absence form or with a doctor's note during an extended absence, marks will be transferred to the final exam (for a contribution of 51% to the course mark). Missed midterms, pre-reading assignments, online quizzes and clicker sessions will be marked zero.

8.2 Laboratory

Attendance at the labs is mandatory. For any missed lab a doctor's note or other official note for the day of the lab is the only acceptable excuse. No supplemental quizzes or other graded course work will be scheduled in case of a missed lab, but a make-up lab must be completed. The lab supervisor is

Khalil Rahman (514-848-2424, ext. 3357; khalil.rahman@concordia.ca).

Labs start in the week of Mon, 8 Sep 2025)

If you are exempted from the lab, you must see complete a request for lab exemption **before 5 Sep 2025 at noon** and send it to Lisa Montesano (chemistry.reception@concordia.ca) and she will register you in the "exempt (56)" section.

8.3 Discontinuing the course

Please note: Discontinuing students receiving a "DISC" notation for CHEM 217 will be required to repeat all components (including the lab) of the course. Students who received a "DISC" before F2024 remain eligible for a lab exemption for up to two years as per departmental guidelines.

9 Course content

Chemistry CHEM 217 is an introduction to the theories and concepts of analytical chemistry. The course will closely follow selected topics from Chapters 0—13 and 27 of the assigned textbook.

9.1 Review chapters

CHEM 217 is an introduction to the theories and concepts of analytical chemistry, with a focus on basic statistics, aqueous equilibria, complexometry

and introductory chromatography. The course closely follows selected topics from chapters of the assigned textbook indicated below. In preparation for the course, I strongly suggest to review the following chapters from General Chemistry. Do not forget to extensively practice your problem-solving skills.

- Stoichiometry
- Types of chemical reactions
- Chemical Equilibrium
- Acids & Bases
- Redox Chemistry

9.2 Chapters covered in detail

Chapter 0 – The Analytical Process

Chapter 1 – Chemical Measurements (required reading)

Chapter 2 – Tools of the Trade (required reading)

Chapter 3 – Experimental Error

Chapter 4 – Statistics

Chapter 5 – Quality Assurance and Calibration Methods

Chapter 6 – Chemical Equilibrium (excerpts)

Chapter 7 – Let the Titrations Begin (excerpts)

Chapter 8 – Activity & Systematic Treatment of Equilibrium Chapter 9 – Monoprotic Acid-Base Equilibria

Chapter 10 – Polyprotic Acid-Base Equilibria

Chapter 11 – Acid-Base Titrations

Chapter 12 – EDTA Titrations

Chapter 13 – Advanced Topics in Equilibrium

Chapter 23 – Introduction to Analytical Separations (excerpts)

Chapter 25 – High-performance Liquid chromatography (excerpts)

Chapter 27 – Gravimetric Analysis (excerpts)

10 Academic Integrity

11 Academic Integrity

11.1 Mandatory seminar & quiz

As part of your CHEM course, you are required to (i) attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources and (ii) pass the online quiz associated with this seminar (the passing grade for the quiz is 100%).

Note: This quiz is graded by the Department of Chemistry and Biochemistry, and you do not have access to it until after you have attended the seminar. Therefore, any other quiz you may have taken on the academic code of conduct does not count toward the CHEM 101 requirement. The aim of this seminar and quiz is to clarify the academic conduct code in terms of which practices will be considered unacceptable with regard to work submit-

ted for grading in your CHEM course. You are only exempt from repeating the seminar and the quiz if you have done both in **Fall 2020 or more recently *.** otherwise you are required to repeat both this term.

This short seminar (1 hour) will be held at the following times (note that you will not be given credit if you join too late and/or leave too early):

Date	**Time**	**Registration Link (paste without line break)**
Tue, 16 Sep	21h00-22h00	https://concordia-ca.zoom.us/meeting/register/g73stJZIQTCX2SopO4xRkQ
Thu, 18 Sep	21h00-22h00	https://concordia-ca.zoom.us/meeting/register/S9BKCvfxTviqk0mfH96H7w
Mon, 22 Sep	21h00-22h00	https://concordia-ca.zoom.us/meeting/register/k9u0tNpLSm-sdxTmrOp1jg

As space for each of the Zoom seminars is limited, please register early for your preferred slot (copy the corresponding link above into your browser). Look out for the Zoom email with the link to the actual seminar. Then do not forget to attend that seminar slot on the date above. You will not receive a reminder on or before the date!

We will take attendance at the Zoom seminar; this means that you must log in with the code that was supplied for your registration. Do not "join a friend" in watching at their computer.

If you do not complete this course requirement, your final grade for the course may be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is completed. Please refer to the undergraduate calendar (section 16.3.5) for details on removal of an incomplete notation.

[*] You are exempt if you can locate your ID in the pdf file located on the Departmental web site (`http://www.concordia.ca/content/dam/artsci/chemistry/docs/Compliance-list.pdf`) and if there is no entry in the "quiz" column for you. If the list does not say "Fall 2020-Summer 2025", you have the wrong list: Clear your browser cache.

11.2 Plagiarism and other forms of academic dishonesty

The Academic Code of Conduct can be found in section 17.10 of the academic calendar (`http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html`). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The mandatory seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

12 Privacy and use of external software

12.1 Personal data

Students are advised that external software and/or websites will be used in the course and students may be asked to submit or consent to the submission of personal information (for example, name and email) to register for an online service. Students are responsible for reading and deciding whether or not to agree to any applicable terms of use. Use of this software and service is voluntary. Students who do not consent to the use the software or service should identify themselves to the course instructor as soon as possible, and in all cases before the DNE deadline, to discuss alternate modes of participation.

12.2 Submission of work

Students are further advised that external software and/or websites will be used in the course and students may be asked to submit or consent to the submission of their work to an online service. Students are responsible for reading and deciding whether or not to agree to any applicable terms of use. Use of this software and service is voluntary. Students who do not consent to the use the software or service should identify themselves to the course instructor as soon as possible to discuss alternate modes of participation that do not require them to give copyright or the right to use their work to a third party.

By using the external software or websites, students agree to provide and

share their work and certain personal information (where applicable) with the website/software provider. Students are advised that the University cannot guarantee the protection of intellectual property rights or personal information provided to any website or software company. Intellectual property and personal information held in foreign jurisdictions are subject to the laws of such jurisdictions.

12.3 Lecture recordings

Note that, as a part of this course, some or all of the lectures and/or other activities in this course may be recorded. Recordings will be focused on the instructor and will normally exclude students. It is possible, however, that your participation may be recorded. If you wish to ensure that your image are not recorded, speak to your instructor as soon as possible.

Also, please note that you may not share recordings of your classes and that the instructor will only share class recordings for the purpose of course delivery and development. Any other sharing may be in violation of the law and applicable University policies, and may be subject to penalties.

13 Intellectual property

Content belonging to instructors shared in courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed,

published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

14 Behaviour

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications. Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

15 List of student services

1. Access Centre for Students with Disabilities (http://www.concordia.ca/students/accessibility)
2. Student Success Centre (http://www.concordia.ca/students/success)
3. Counselling and Psychological Services (http://www.concordia.ca/students/counselling-life-skills)
4. Concordia Library Citation and Style Guides (https://library.concordia.ca/help/citing)
5. Health Services (http://www.concordia.ca/students/health)
6. Financial Aid and Awards (http://www.concordia.ca/offices/faao)
7. Academic Integrity (http://www.concordia.ca/students/academic-integrity)
8. Dean of Students Office (http://www.concordia.ca/offices/dean-students)
9. International Students Office (http://www.concordia.ca/students/international)
10. Student Hub (http://www.concordia.ca/students)
11. Sexual Assault Resource Centre (http://www.concordia.ca/students/sexual-assault)

12. As a Concordia student, you are a member of the Concordia Student Union and have many resources available to you including HOJO (Off Campus Housing and Job Bank: `https://www.csu.qc.ca/services/hojo/`) and the CSU Advocacy Centre (`https://www.csu.qc.ca/services/advocacy/)`.

13. Aboriginal Student Resource Centre (http://www.concordia.ca/students/aboriginal)

14. Concordia Mental Health (https://www.concordia.ca/students/health/mental-health.html)

16 Territorial acknowledgement

We would like to begin by acknowledging that Concordia University is located on unceded Indigenous lands. The Kanien'kehá:ka Nation is recognized as the custodians of the lands and waters on which we gather today. Tiohtià:ke/Montréal is historically known as a gathering place for many First Nations. Today, it is home to a diverse population of Indigenous and other peoples. We respect the continued connections with the past, present and future in our ongoing relationships with Indigenous and other peoples within the Montreal community.